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MALFORMATION OF THE HEART:

ATRESIA OF THE ORIFICE OF THE PULMONARY ARTERY;

AORTA COMMUNICATING WITH BOTH VENTRICLES.

BY

THOMAS B. PEACOCK, M.D., F.R.C.P.

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The subject of this case was a girl thirteen years of age, a patient of Dr. S. Sanders Stephens, who gave the following account of her condition:—"She presented characteristic symptoms of cyanosis, the face and lips being blue, or rather purple, more so than any case I ever saw. She could only walk three or four steps, so that she was always carried up stairs or even about the house. When she was brought to me she was wheeled in a perambulator. Her mother said that she had always suffered in the same way since the time of her birth, but that the blueness of the skin and the inability to walk had got worse gradually. The heart seemed to have only one prolonged sound, with a murmur before, through, and after it."

Dr. Stephens regarded the case as one of malformation of the heart, and gave the opinion that the girl would survive only a short time. The following morning she died suddenly, when she was either sitting up or reclining. There was much difficulty in obtaining permission to make a *post-mortem* examination, and the examination was unavoidably very hastily performed, and the heart was unfortunately removed with only a short portion of the aorta and pulmonary artery attached.

Externally the heart had much the natural shape; it was longer than it was wide, and was about the proper size for a child of the age. The aorta arose further to the right than usual, and was from its origin entirely exposed in the pericardium. On opening the cavities the right auricle was found somewhat large, and the foramen ovale was entirely closed. The right ventricle was formed almost wholly of the sinus, and its walls were thick and firm; the infundibular portion was, on the contrary, reduced to a small canal with thin parietes. There was a very distinct separation between the sinus and infundibular portions of the ventricle, so that they formed distinct though connected cavities. The aorta communicated freely with the sinus, but the infundibular portion, instead of giving origin to the pulmonary artery, terminated with a kind of septum or diaphragm, which was entirely impervious, so that there was no communication between the cavity of the ventricle and that of the artery. This septum was evidently formed by the semilunar valves united together. It was thick and opaque, and was protruded forwards in the course of the pulmonary artery so as to have a funnel shape, the base being towards the ventricle and the pointed extremity towards the artery. Near the point there was a small blind furrow or punctum, which seemed to indicate the seat of a former opening. On one side of the septum there was a process, resembling the raphe or cross-bar met with in cases of fusion of the valves, and probably indicating the former existence of a separation into two or more segments. The trunk of the pulmonary artery was of small size, but quite pervious down to the upper surface of the septum; its coats were thin. The left auricle was natural; the left ventricle of small size relatively to the right, and its walls of about the usual width. The aorta communicated with both ventricles through the medium of an opening between them from deficiency of the base of the septum; it had, however, more direct connection with the right than with the left cavity. The vessel was of unusually large size. Both the aorta and pulmonary artery were unfortunately cut off so low down that the state of the ductus arteriosus could not be ascertained.

It will thus be seen that this case offered a very decided and, considering the age of the patient, a very remarkable instance of entire obliteration of the orifice of the pulmonary artery; but the preparation, unfortunately, does not show the means by which this defect was compensated, or the channel through which the blood was transmitted to the lungs. From the trunk of the pulmonary artery being completely open, and from the unusual calibre of the aorta, it may, however, be probably concluded that, as in by far the largest proportion of cases of the kind, the ductus arteriosus was still pervious; and that a portion of the blood entering the aorta was so conveyed to the pulmonary artery, and through its branches to the lungs. It is, however, impossible to know whether the blood so transmitted was all that reached the lungs, and whether there might not have existed other channels by which the supply was complemented, as occurs in some such cases. The foramen ovale was closed in this instance—a condition which, though occasionally found in cases of occlusion of the orifice or trunk of the pulmonary artery, is only met with when the septum of the ventricle is imperfect.

As regards the mode in which the obliteration of the pulmonary orifice was brought about in this case, it would appear that at an early period of fœtal life, before the septum of the ventricles was completed, the valves of the pulmonary artery became either united together if formed as separate segments, or had their development arrested if originally consisting of a simple fold of membrane. They would thus form an annular septum, or diaphragm, which, by interfering with the flow of the blood from the right ventricle into the artery, would tend to divert the current into the left ventricle; and thus the further growth of the septum would be prevented, and the two cavities would remain permanently in communication. The pulmonary artery would also cease to increase in capacity, and, as the collateral channels became more completely established, might even diminish in size, till finally, either before or after birth, the aperture might become entirely closed. The peculiar blind depression at the apex of the valvular septum seemed to indicate the point at which an opening had at some former period existed.

It is to be regretted that the idea should still so generally prevail that cyanosis is dependent on intermixture of the currents of venous and arterial blood. It has been shown repeatedly and by different observers, that cyanosis may occur without any intermixture; that the freest intermixture may occur without cyanosis; and that, when the two conditions coexist, there is not any constant relation between the amount of intermixture and the degree of cyanosis. It has, therefore, been concluded that the intermixture, though it may be an element in the production of the discoloration, is not its essential cause ; and the best authorities are agreed in assigning the cyanosis to venous congestion caused by the obstruction to the circulation ; though it is probable that the darkness of the blood from its imperfect aëration, and the thinness of the integuments from defective nutrition, may modify the colour of the surface. In consequence, however, of the former view being still so generally entertained, pathologists are apt, in conducting *post-mortem* examinations, to confine their attention to the state of the heart itself, and to neglect looking to what is of equal importance, the condition of the aorta and pulmonary artery. In by far the largest proportion of cases of cyanosis the orifice of the pulmonary artery is the seat of some kind of obstruction, and when this is extreme the great interest of the case lies in ascertaining by what means the transmission of the blood to the lungs is effected.

The case is further interesting from the age which the patient attained. In no other instance of entire obliteration of the pulmonary artery on record did the subject survive beyond nine or ten years of age.

Remarks.—The form of cardiac anomaly of which this specimen affords an example is one which, though of less frequent occurrence than the cases of contraction or stenosis of the pulmonary orifice, has yet been met with in a considerable number of cases. The first instance of the kind which was placed on record was published in this country by Dr. Hunter in 1783. A second was related by Hodgson in 1812, and others have since been reported by Howship, Farre, and other writers. In Germany a case was published by Fleischmann in 1815, and a second by Basedow in 1828. One which occurred to M. Lordat, of Montpellier in 1822, was recorded by Gintrac in 1824; and a case, combining other serious deviations from the natural development of the heart, was related by Breschet in 1826. In America a case, also of a complex character, was published by Mauran in 1829. Since these dates numerous cases have been recorded, so that I have been able to collect together in the appendix not less than thirty-five cases, including that just related ; and references have been met with to two or three others, of which the full reports cannot be obtained, or which are too imperfectly reported for the precise nature of the malformation to be ascertained. Of the cases collected I proceed to give an analysis.

1. *Seat and form of the obstruction.*—The precise seat of the obstruction in cases of this kind, and the mode in which it is brought about, varies in different cases. Of the thirty-five cases contained in the table, in four the seat and extent of the obstruction is not described. Of the remaining thirty-one, in twenty-four it was situated at the commencement of the artery, and a portion of the trunk of the vessel still continued pervious, forming a blind canal, or, as it is often described, a "cul de sac," extending from the bifurcation of the artery for a greater or less distance towards its origin from the ventricle. In three cases, and probably in a fourth, the whole course of the vessel was obstructed, so that it was converted into a solid cord extending from its origin to the division into the pulmonary branches. In one case[1] it is not clear from the report whether the orifice of the vessel was obliterated, though the termination in the pulmonary arteries was imperforate. In two cases also it may be doubted whether any portion of the vessel was really impervious, though the reporters consider that no blood had been transmitted through it.[2]

Of the twenty-four cases in which the obstruction was situated at the commencement of the vessel, in seven it was caused by a membranous septum stretched across the aperture, on the upper or arterial surface of which there were some indications of valves. In three other cases the aperture was also closed by a diaphragm or septum, but this was partly composed of muscular substance and there was no appearance of valves. In the former class of cases it may be concluded that the septum was caused by the adhesion of the edges of the valves together, or by arrest of the process of development by which a simple fold of the lining membrane of the ventricle and artery is separated into distinct segments. In the second form of obstruction the defect is probably situated in the fibrous zone and muscular structure at the termination of the infundibular portion, or conus arteriosus, of the right ventricle.

In the cases in which the whole trunk of the vessel is obstructed the disease may either have commenced at the outlet of the ventricle, in the valves at the origin of the artery, or in some portion of the arterial trunk itself. Probably, however, the disease generally commences in one or other of the former situations, and involves the trunk of the vessel secondarily. In two or three of the cases in the appendix this process of obliteration appears to have been in progress, the orifice of the vessel being imperforate, and a portion of the trunk filled with adherent coagulum. It is probable that the process of obliteration is a more or less gradual one, the orifice being first diminished in capacity by an annular constriction, and the blood so forced into the collateral channels; as these become established, the vessel, giving passage to a constantly diminishing current of blood, will decrease in calibre, till at length, by the deposits of fibrinous concretions on the edges of the obstructing ring, the opening may be entirely closed. It has before been mentioned that in the case here described there is at the point of the funnel-shaped septum a small blind furrow or pit, which seems to indicate the point at which an opening had at some former time existed. In cases of simple stenosis or constriction of the orifice by disease of the valves, such fibrinous concretions are very frequently found on the edges of the constricting ring.

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[1] Basedow.

[2] Shearman, and Quain and Sibbald.

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2. *Means by which the blood is transmitted to the left side.*—In cases in which the outlet of the right ventricle is completely impervious, it is evident some compensating means must exist by which the blood can be transmitted to the left side of the heart and conveyed thence to the lungs, without which extra-uterine life could not be maintained. Accordingly, we find that in all such cases of which the description is complete, either the septum of the ventricle is reported to have presented some imperfection, or the foramen ovale was still open, or both passages continued pervious.

Of the cases collected, the septum of the ventricles is stated to have been entire in seven cases, and more or less defective in twenty-seven. In three of the cases the ventricle was essentially single, presenting little, if any, appearance of the septum; in five the deficiency was considerable; in two cases it is stated that the opening would admit the forefinger, in four the little finger, in one only a large goose-quill; and in two cases the defect is said to have been slight; and in one of these there were only some muscular fibres wanting in the septum, and the lining membrane had three foramina in it. In one case the opening between the ventricles was oblique. Generally the aperture is described as round, or angular with the angles rounded off, partaking more or less of the shape of the so-called "undefended space" at the base of the septum in the well-formed heart.

The foramen ovale is reported to have been closed in only five cases. In four of these the septum of the ventricles was incomplete, and in the fifth there was a passage leading from the right ventricle into the aorta of which the precise nature is not clear. In two cases the opening in the foramen ovale was very small, the septum of the ventricles being entire in one of them. In nine the foramen ovale was largely open, and in one the partition of the auricles was entirely wanting. In one case there were two openings in the septum; and in one case, in which the foramen was itself closed, there was an opening in another part of the septum.

These defects in the ventricular and auricular septa were regarded by the earlier writers as being the necessary means for the maintenance of the circulation, in cases in which the transmission of the blood from the right ventricle was obstructed. Morgagni, in the case of a young female in whom the pulmonary orifice was contracted from adhesion of the valves and the foramen ovale unclosed, regarded the latter condition as the necessary result of the former; and Dr. Hunter, in commenting on his case of obstruction of the orifice of the pulmonary artery and defect in the septum of the ventricles, draws a similar conclusion as to the relation of the two defects. Though, however, these views seem so obvious as scarcely to require to be enforced, they were overlooked, and the aperture in the septum of the ventricles was regarded as a primitive defect which entailed the diseased condition of the pulmonic valves. Such appears to have been the view of Meckel. The earlier theory has, however, been maintained by Dr. Williams and Dr. Craigie, and more recently by Dr. Chevers and myself, and an elaborate demonstration of its correctness has been more recently given by Dr. Meyer, of Zurich.[1] It is evident that if during the earlier period of fœtal life, before the septum of the ventricles is completed, some obstruction is created at the orifice of the pulmonary artery by which the blood entering the right ventricle is prevented from leaving the cavity by the natural channel, it will flow into the left ventricle by the aperture in the septum, and so the separation of the ventricular cavities will be prevented; and if a similar obstruction occur at the later periods of fœtal life, when the septum of the ventricles is completed, it will prevent the closure of the foramen ovale after birth.

In the cases in which the septum of the ventricles is incomplete the aorta is generally found to be placed further to the right than natural, so that it comes to be connected equally with the two cavities, or to have more direct connection with the right ventricle, or even to arise entirely from that cavity. Of the cases in the appendix in which the information is complete on these points, in six the aorta is stated to have arisen entirely, and in three chiefly, from the right ventricle; and in twelve cases its origin was placed immediately above the aperture in the septum of the ventricles, so that it communicated equally with the two cavities. This position of the aorta is, doubtless, in part due to arrest of development, so that the vessel occupies the situation proper to it at the earlier periods of fœtal life; but it is also probably promoted by the connection between the aorta and right ventricle, and the consequent flow of blood from that cavity into the vessel, tending to draw the artery further to the right. To the same cause may also be ascribed, in part at least, the widening and expansion of the ascending portion of the aorta, which is also so generally noticed in cases of this kind.

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[1] 'Archiv für Path. Anat. u. Phys. Von Virchow,' 12 Band, 1857, p. 497.

3. *Means by which the blood is conveyed to the lungs.*—When obstruction occurs in the orifice or trunk of the pulmonary artery by which that vessel becomes incapable of transmitting the blood to the lungs, the pulmonary circulation is generally carried on through the aorta and ductus arteriosus. Of the cases in the appendix, in three no mention is made of the condition of the duct in the reports, or the preparations do not afford the means of ascertaining its state. Of the remaining cases, in twenty-four the duct is said to have been pervious throughout to a greater or less extent; and in three others a vessel is stated to have passed from the aorta to the bifurcation of the pulmonary arteries, which may be concluded to have been the duct; so that in twenty-seven cases the duct may be inferred to have been the channel by which the blood was conveyed to the pulmonary vessels. In another case there was a direct communication between the trunk of the pulmonary artery and the aorta. In one case the duct is stated to have been closed, and no mention is made of the source of the pulmonary supply, and in another the duct was probably closed under similar circumstances. In one case there was no duct, and the supply of blood to the lungs was furnished by vessels from the aorta. In another case the duct was closed, and the pulmonary arteries, which were pervious, are supposed to have received their blood by a branch from the left subclavian artery; and in a third case the ductus arteriosus was pervious, but the supply of blood furnished through it to the lungs

was supplemented by branches from the aorta. Similar supplementary vessels from the aorta or some of its branches doubtless furnished the supply to the lungs in the two cases mentioned in which the duct was closed and no obvious source of supply was detected, though in one of the cases it may be doubted whether the orifice of the pulmonary artery was completely impervious.

It may safely be concluded that when the ductus arteriosus is pervious in cases of occlusion of the pulmonary artery, that passage will furnish the supply of blood to the lungs, and it is probably only when the duct is prematurely obliterated, or when, from being unusually small or otherwise constricted, it is incapable of transmitting the supply or of furnishing it in adequate amount, that other collateral channels are provided. Such supplementary branches doubtless are furnished by the bronchial arteries, which are said to anastomose with the branches of the pulmonary arteries.

The size of the duct is reported in twenty-four of the cases referred to in the appendix. In eight it is said to have been large, in ten of ordinary size, in one as large as a goose-quill, in three as a crow-quill, in one very small, and in one very small and unusually short. In one case it was large towards the aortic but small at the pulmonic end. Its situation also varied in some degree; in one case it is said to have arisen from the aorta at its ascending portion, in others to have been connected with the under surface of the arch, and in yet others to have arisen opposite the left subclavian artery.

4. *Condition of the heart, &c.*—The hearts which are the seats of this kind of anomaly ordinarily present other irregularities besides those which have been referred to. They are generally observed to be unusually wide, so that they measure more from side to side than from above downwards, thus presenting a resemblance to the form of the heart in the chelonian reptiles. They are ordinarily also larger and heavier than the average of hearts at the same age. The aorta is generally placed further to the right than natural; is of unusually large size at its ascending portion, and continues so to beyond the point at which the ductus arteriosus is given off; and from the absence of the pulmonary artery or its small size, the whole of the commencement of the vessel is exposed in the pericardium. When the septum of the ventricles is entire the course of the blood is from the right auricle through the foramen ovale into the left auricle, thence into the left ventricle, where it receives the portion of blood returned from the lungs, and so into the aorta. The right

ventricle, therefore, being left out of the channel of the circulation, becomes remarkably small or is almost obliterated, and its walls are loose and weak ; while the left ventricle, which maintains both the systemic and pulmonic circulation, is large and powerful. When, on the other hand, the septum of the ventricles is imperfect and the aorta is in direct connection with the right ventricle, the double circulation is chiefly maintained by that cavity, and it becomes large, at least in the sinus, and its walls thick and firm; while the left ventricle is comparatively small and weak. When the aorta arises above the defect in the septum and communicates equally with both cavities, both ventricles are large and powerful.

From the reports it will be seen that the hearts are also occasionally found to present defects not necessarily connected with the condition of the pulmonary artery. Thus, in one case the organ was situated on the right side of the chest. In two cases the right ventricle was partially divided between its sinus and the infundibular portion ; or, in other words, the tendency to occlusion, which had become entire at the pulmonary orifice, was also shown by the formation of a kind of septum between the two portions of which the cavity originally consists, and which are respectively the analogues of the right aortic and of the pulmonic ventricle in the turtle. In several cases the vessels given off at the arch were irregular ; and in some instances the pulmonary veins ; thus there were in different cases one, two, three, four, and five pulmonary veins. In one case there were two descending cavæ. In most cases in which life was not much prolonged the thymus was of unusually large size; and the head is reported to have been irregularly developed in some cases ; one patient had hernia of the liver, and another spina bifida.

5. *Symptoms; viability; cause of death.*—The symptoms which are recorded to have been observed in cases of this description of malformation are those which are most characteristic of congenital cardiac anomalies. Cyanosis was observed to a marked degree in twenty out of the twenty-eight cases in which there are histories of the symptoms during life. In three others there was lividity, but not to a marked degree, and generally only noticed when the children were excited by crying or when they were suffering from the suffocative attacks. In two cases the patients are reported not to have been cyanotic, but to have had a peculiar dusky or ash-grey colour ; one was alternately pale and livid; one was decidedly pale; and two are stated not to have presented any appearances of cyanosis.

The suffocative attacks were as frequently present as the cyanosis, and they are stated to have been generally brought on by the slightest excitement or exertion. At other times there was generally more or less dyspnœa, tumultuous action of the heart or palpitation, jugular pulsation, &c. In some cases there was cough and expectoration, and occasionally blood was brought up. The children also were generally chilly and very susceptible to cold. Their fingers and toes were clubbed, and they were occasionally œdematous about the face or other parts of the body, and liable to unhealthy inflammation of the integuments, with tendency to sloughing and ulceration. The digestive organs were very generally disordered, the patients suffering from sickness and vomiting, diarrhœa, and occasionally the passage of blood by stool; in one case there was jaundice. The nutrition was also impaired, so that the children which survived for longer periods after birth were usually greatly emaciated. Generally speaking, symptoms characteristic of some defect in the conformation of the heart were observed at or shortly after the birth of the child. This is stated to have been the case in sixteen out of twenty-three cases in which the histories are complete on this point; while in the other seven the children are reported to have appeared healthy when born, and the indications of defect did not present themselves till some short time after, in one case not till a month had elapsed. The stethoscopic signs were not generally accurately recorded in these cases, and this can scarcely be a matter of surprise to any one who knows the difficulty of examining such patients, who are so often fretful and apt to cry, and in whom the action of the heart and the breathing are so easily hurried. In the cases in which the physical signs are noted they consisted of bellows murmurs, heard at the base of the heart with the systole and transmitted over the upper part of the chest, such murmurs being doubtless due to the currents of blood thrown from the two ventricles meeting in the aorta. The physical signs alone could, however, scarcely afford the means of diagnosing the precise nature of the malformation; but the great intensity of the cyanosis, the frequency of the suffocative attacks and the urgent dyspnœa, and the circumstance that the symptoms were observed at or very shortly after the time of birth, would render it probable that the case was one of the more aggravated forms of cardiac anomaly, in which the transmission of the blood to the lungs was seriously interfered with, and not simply a case of stenosis or contraction of the orifice of the pulmonary artery.

The duration of life in the subjects of this form of cardiac defect varies with the nature of the case; and, curiously enough, it would appear that when the defect occurs at the earlier periods of fœtal life, before the septum of the ventricles is completed, there is greater probability of the patient surviving than when the orifice of the pulmonary artery becomes obstructed at a more advanced stage of uterine life, after the separation of the ventricles has been effected. Thus, it appears that in the latter class of cases, eight in number, life was prolonged in six for periods varying from a few days to six weeks, and in two only did the patients survive nine months and two years, the last being, indeed, a case in which there was some communication between the right ventricle and the aorta, the nature of which is not clear. On the other hand, in twenty-five cases in which the septum was deficient, fourteen survived for periods exceeding six months, and four of them for nine years, nine or ten years, ten, and thirteen years.[1] The difference in the viability of the patients is apparently due to the greater facility afforded for the circulation of the blood when the ventricular septem is imperfect, than when the blood has to flow through the foramen ovale into the left auricle, and so into the left ventricle. It is remarkable that in two of the cases in which the patients survived for the longest periods the means afforded for the transmission of the blood to the lungs were apparently very insufficient. Thus, in one of these the duct was closed, and the blood is supposed to have reached the pulmonary arteries by a branch from the left subclavian artery.[2] In another the duct was open, but one of the pulmonary arteries was entirely obstructed by coagulum, and there were compensatory branches from the aorta.[3] In a third case no channel was detected by which the blood could be transmitted, but it may be doubted, from the description, whether the pulmonary artery was not capable of giving passage to some blood.[4] In the fourth case, that described in this paper, in which the patient survived for the longest period, thirteen years, the pulmonary supply was probably furnished in the usual way, through the ductus arteriosus. In the sixty-first volume of the 'Medical and Physical Journal'[5] a case is described by Dr. Ramsbotham, in which the patient lived to the age of sixteen, and the pulmonary orifice is said to have been obliterated. I have, however, ascertained, by examination of the specimen, which is contained in the Museum of the

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[1] Shearman, Chambers, Babington, and other cases in paper.

[2] Chambers. [3] Babington. [4] Shearman. [5] Page 548.

London Hospital, that there is a small pulmonary artery which arises from the right ventricle, and must have transmitted some blood to the lungs, though the supply thus furnished was complemented by branches from the aorta.

The immediate cause of death was in by far the largest proportion of cases, the direct result of the obstruction to the circulation of the blood and its imperfect aëration—the suffocative and convulsive attacks. In other cases the patients died of pulmonary congestion and inflammation, bronchitis, pneumonia, &c. In two cases, both patients dying at relatively advanced ages, there were old adhesions of the pericardium. In one case, which also proved fatal at a late period, miliary tubercles were found in the lungs; and another patient died of sloughing of the integuments.

The cases of atresia of the pulmonary orifice or artery are analogous to another class of congenital defects, in which there is no trace of the pulmonary artery, and the supply of blood to the lungs is furnished from a common trunk. These cases may, however, be divided into two groups, which differ considerably as regards the degree of defect.

In one series there is a single vessel arising from a ventricular cavity, which is usually imperfectly divided and in connection with more or less completely separated auricles. The vessel gives off the coronary arteries in their usual situations, and at the arch the ordinary branches arise, and the pulmonary arteries are either given off by a common trunk or arise separately. In the second group there is one vessel arising from a single ventricle and that in connection with a single auricle. The common vessel gives origin to no vessels, but divides some distance beyond its commencement into two trunks, one of which furnishes the pulmonary arteries, the other the systemic vessels; and at about the point of bifurcation, or from one of the secondary branches, the coronary arteries are given off.

The former group is more closely allied to the cases of atresia of the pulmonary artery; and is indeed, I conceive, only an aggravated form of that defect, in which the pulmonary artery has become abortive at so early a period of development as wholly to disappear. If so, the single vessel represents the aorta, and the branch or branches given off from that vessel and supplied to the lungs are the remains of the ductus arteriosus and the pulmonary arteries. The second group constitutes a much more aggravated form of defect, in which the single character of the heart is retained, and the vessel represents the primitive arterial trunk or bulbus arteriosus, which has not undergone division. The cases of Standert and Combe,[1] Bigger,[2] Beckhaus,[3] Carson,[4] Crisp,[5] Hervieux,[6] Buchanan,[7] and Green,[8] afford instances of the former class of cases. Those of Wilson,[9] Farre,[10] Forster,[11] Clarke and Owen,[12] Vernon,[13], and Heath and Power,[14] of the latter.

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[1] 'Phil. Trans.,' 1805; and 'Path. Trans.,' vol. i, p. 48.

[2] Quoted in 'Ed. Med. and Surg. Journal,' vol. lv, 1841, p. 251.

[3] Friedberg, p. 86.

[4] 'Ed. Med. and Surg. Journal,' lxii, 1844, p. 134.

[5] 'Path. Trans.,' vol. i, p. 50.

[6] 'Union Médicale,' 1861, t. x, p. 421.

[7] 'Path. Trans.,' xv, p. 89.

[8] Ibid., xix, 188.

[9] 'Phil. Trans.,' 1798.

[10] 'Malformations,' p. 2.

[11] 'Path. Trans.,' vol. i, p. 48.

[12] 'Lancet,' vol. ii, p. 664, 1848.

[13] 'Med.-Chir. Trans.,' xxxix, 1856, p. 300.

[14] 'Path. Trans.,' xvi, p. 62.

Cases of atresia of the pulmonary artery—(a) with complete septum ventriculorum.

Author and reference.	Seat and form of obliteration.	State of foramen ovale and auricular septum.	State of ductus arteriosus and source of pulmonary supply.	Condition of other parts of heart.	History of case.
1 Hunter, 'Med. Obs. and Enq.,' vol. vi, 1783, p. 291, Case 1	Pulmonary artery at its beginning from the right ventricle contracted into a solid cord, and completely impervious, but the trunk open, though small	Foramen ovale very large	Ductus arteriosus open, and resembled a branch from the aorta, and furnished a scanty supply to the pulmonary arteries. It arose immediately opposite the left subclavian artery	The right ventricle had scarcely any cavity left, and the auriculo-ventricular aperture was especially small. The left ventricle was large and powerful	In a male child born at the eighth month, and which during its life was either quite black or of a deadly pale ash colour. It had violent palpitation, and died in convulsions on the thirteenth day.
2 Lordat and Dalmas, 1822, Gintrac, 'Sur la Cyanose,' Paris, 1824, Obs. 53me, p. 201	Pulmonary artery small and obliterated at its orifice, where the trunk of the vessel formed a small cul de sac	Foramen ovale largely open	Ductus arteriosus natural	Parietes of right ventricle very thick and cavity small, and right aur. ventr. ap. also small. Auricles and left side of heart natural	In an infant six weeks old, which was well-developed, and when tranquil had a natural colour, except that the lips were blue. On crying it became altogether blue, and was subject to suffocative attacks, in one of which it died.
3 Hall & Vrolik, quoted in 'Archiv Gén. de Méd.,' t. viii, 1825, p. 594, from 'Practisch Tijdscrift voor de Geneeskunde,' 1825	Pulmonary artery separated from the right ventricle by a diaphragm in which there were evidences of semilunar valves. The report speaks also of a vessel passing from right ventricle to aorta	Foramen ovale closed	A vessel (? ductus arteriosus) arising from the aorta, and communicating with the pulmonary artery and its branches	The aorta arose from the right ventricle, and that side was thicker than the left	In a female child born at Amsterdam, and decidedly cyanotic from birth. It became subject to difficulty of breathing and palpitation when a month old, and died at the age of two years. Thymus very large.

Author and reference.	Seat and form of obliteration.	State of foramen ovale and auricular septum.	State of ductus arteriosus and source of pulmonary supply.	Condition of other parts of heart.	History of case.
4 Ollivier, 'Bullet. de la Soc. Anat.,' t. xxxvi, année 1861, N. S., t. vi, p. 320	Pulmonary artery reduced to a cord two millimètres in diameter, and terminating in a cul de sac, from which the opening into the ventricle was entirely imperforate	Foramen ovale open	Ductus arteriosus open, and furnished the pulmonary branches	Right ventricle nearly rudimentary. Left ventricle large, and gave origin to aorta. Left auricle small	In a female child which lived two days in the infirmary of the Hôspice des Enfants Assistés, under M. Hervieux, and died when seventeen days old. The face was pale, but the lips livid. The sounds of the heart were natural.
5 Gueniot, ibid., t. xxxvii, année 1862, N.S., t. vii, p. 159	Pulmonary artery smaller than usual and obliterated at its origin, and the surface marked by lines and sacs showing the remains of valves	Foramen ovale freely open	Ductus arteriosus open, and furnished supply to pulmonary artery and its branches	Right auricle very large and walls thin. Right ventricle entirely rudimentary, and showed slight prolongation in direction of pulmonary orifice. Left auricle somewhat large, and left ventricle large and walls thick	In a child which lived fourteen days, and had cold extremities and was of a blue colour, but displayed no disorder of the respiratory organs, and was not convulsed. There was no marked murmur at the heart.
6 Hare, 'Path. Trans.,' vol. iv, 1852-53, p. 81	Orifice of pulmonary artery entirely closed. The vessel terminated in a cul de sac, but became about its middle about an inch in circumference. There were some minute folds, probably the remains of the pulmonary valves	Foramen ovale open, but only for $\frac{1}{16}$th of an inch in breadth and $\frac{1}{12}$th in length. The aperture between the two auricles was direct	Ductus arteriosus arose from the aorta by an aperture which would admit a crow-quill, and the pulmonary artery divided into its branches as usual	Right auricle very large. Right vent. formed almost a solid mass, the columnæ carneæ being nearly fused into one, so that there only remained a space capable of holding a small pea. Left aur. small and walls thick, and left vent. very thick. Aorta arose as usual	In a male child born at the full period, and which at birth presented nothing remarkable, but afterwards the extremities became cool and had a dusky colour, and on coughing were blue. He became emaciated, and died suddenly when nine months old, not having been previously convulsed. A slight purring tremor was felt an inch to the left of the left nipple, and at the apex of the heart a "hush-blowing" systolic murmur was heard, and also at left interscapular region.

7 Rokitansky, 'Wochenblatt der Zeitschrift Jahr.,' 1855, s. 225, N. 14, quoted by Heine, 'Angeborne Atresie des ostium arteriosum dextrum,' Tubingen, 1861, s. 21	The right arterial opening closed, and the conus arteriosus terminated in a pointed end	Foramen ovale large, and its valve thin	Ductus arteriosus wide near the aorta, and narrow near the pulmonary artery	Left side of heart greatly hypertrophied and dilated. Aorta arose as usual	A female infant, which lived five days.
8 Peacock, 'Path. Trans.,' vol. xv, 1863-64, p. 60, Dr. Lauchester and Mr. Saul's case; 'Malformations,' 2nd ed., 1866, p. 72, Case vi	Orifice of pulmonary artery entirely obstructed by adhesion of valves, which showed on arterial side three ridges and corresponding depressions. Trunk of pulmonary artery somewhat small, but pervious to septum formed by united valves	Foramen ovale freely open	Ductus arteriosus of natural size, arose from aorta as usual, and furnished supply to trunk and branches of pulmonary artery	Heart very wide from side to side. Walls of right vent. soft and yielding, and cavity small; of left vent. hard and resistant, and cavity large; ascending aorta of large size, but diminished in calibre after giving off duct. art. Heart weighed, after being in water, 16¾ drachms avoird.	In a cyanotic child, which lived nine days.

Cases of atresia of the pulmonary artery—(b) with imperfect septum ventriculorum.

Author and reference.	Seat and form of obliteration.	State of foramen ovale and auricular septum	State of ductus arteriosus and source of pulmonary supply.	Condition of other parts of heart and extent of septal defect.	History of case.
1 Hodgson, 'Lond. Med. Rev.,' vol. v, 1812, p. 262; and Farre, on 'Malformations,' 1814, p. 19	Pulmonary artery reduced to an impervious filament leading to ductus arteriosus	Foramen ovale largely open	Ductus arteriosus of large size, and gave off pulmon. branches	In septum of ventricles some of the muscular fibres were wanting, and the lining membrane of the left ventricle had three foramina, giving it a cribriform appearance. Right aur. vent. ap. and right vent. small. Left vent. unusually large	The child was of a deep purple colour soon after birth, and had difficulty of breathing. It died in convulsions on the seventh day
2 Weston, case which occurred in 1809. Farre, p. 27	Pulmonary artery imperforate as far as its bifurcation	Foramen ovale probably closed	Ductus arteriosus large, and supplied blood to pulmonary branches	Considerable imperfection of sept. vent. Aorta arose from both ventricles, chiefly the right. Right auricle and ventricle larger than left	In a female infant which lived five wks. Its colour was blue, and on crying became very dark. It was always chilly, and difficult to keep warm and had infln. and ulceration of integ. about umbilicus, &c. It suffered also from diarrhœa, and the breathing was short.
3 Howship, 'Practical Observ. in Surg. and Morbid Anatomy,' 1816, p. 193; 'Edinb.	Pulmonary artery arose in the proper situation, but was imperforate at its origin. The trunk formed a cul de sac terminating close against	Foramen ovale open	Ductus arteriosus open, so that a probe passed readily from the aorta into the pulmonary branches	Aorta larger and more open towards the right than the left ventricle. Right auricle dilated, and walls of right ventricle thick. Left auricle contracted, and	In a child which lived nearly six months, and was healthy for the first month. She then became emaciated, and on crying or coughing the skin was of a dark colour. For a

Med. and Surg. Journal,' vol. ix, 1813, p. 399, with good plate; Farre, p. 27	the lining membrane of the ventricle			walls of the left ventricle thin	day or two before death she had screaming fits, threatening suffocation, and her breathing was embarrassed.
4 Mr. Langstaff. Farre, p. 19. Dr. Farre mentions that there was a second case in Mr. L.'s museum, from a stillborn child, and that he examd. two others	Case stated to be like the above, but a precise description not given	Foramen ovale probably open	Ductus arteriosus remarkably short and very small	Considerable perforation in the septum ventriculorum, which was, however, nearly closed by fibres which almost filled right ventricle	Child which lived six months. It was of a dark purple colour, approaching to black; its temperature was below the natural standard, and it had fits daily.
5 Fleischmann, 'Meckel Arch. f. d. Phys.,' 1815, p. 284; Leichenöffnungen, 1815, S. 193	The orifice of the pulmonary artery closed	...	...	Heart consisting of three cavities, two auricles, and one ventricle. The vent. gave origin to aorta and pulmonary artery	In a child which lived two weeks.
6 Breschet, 'Sur l'Ectopie,' 1826, obs. 1. Case examined with J. F. Meckel, of Halle	Pulmonary artery imperforate at its orifice, and had no connection with the ventricle	Auricles connected by two openings	Ductus arteriosus largely open, and supplied blood to pulmonary arteries	The child displayed other malformations—spina bifida, &c. The heart was situated on right side of chest, and the pulm. veins entered the right aur. There were two descending cavæ. The vent. was undivided, and gave origin to the aorta and also to pulm. artery; aorta passed to right of spine	A male infant, born at the full period, which lived a month. It did not present any peculiarity of colour.

Author and reference.	Seat and form of obliteration.	State of foramen ovale and auricular septum.	State of ductus arteriosus and source of pulmonary supply.	Condition of other parts of heart and extent of septal defect.	History of case.
7 BASEDOW, 'Journ. der practischen Heilkunde v. Hufeland und Osann,' lxvii Bd., 1828, 1 Stück Julius, s. 78	The rudiment of the pulmonary artery was found near the mouth of the aorta in the form of a slight prolongation from the ventricular cavity, and near the aorta as a shrunken ligamentous cord	The foramen ovale open to the extent of admitting a goose - quill. Both auricles more muscular than usual. The lungs were small, and the thymus very large	Ductus arteriosus remaining open, and supplied blood to the pulmonary vessels	The heart of a rounded form, and the two ventricles of equal thickness. A large deficiency at the base of the sept. of the ventricles, and the aorta arose above it. Pulmonary veins natural	A female child, seen when in her second year, and labouring under infln. of the chest. The breathing was rapid and noisy. She had a severe cough and hot skin, and the face and extremities were blue, and became darker when she cried; afterwards the nails became arched. She died some weeks after in a suffocative attack.
8 MAURAN, 'Archiv Gén. de Méd.,' t. xix, p. 256, 7me année, 1829; quoted from 'Philadelphia Journ. of Med. & Phys. Sciences,' vol. xiv, 1827, N.S., vol. v, p. 253	A rudimentary pulmonary artery, which was obliterated at its origin, the trunk being, however, pervious so as to form a cul de sac	The aur. undivided, but two auricular appendages	Ductus arteriosus largely open, and furnished supply of blood to pulmonary artery and branches	Ventricle undivided, and giving origin to aorta and obliterated pulmonary artery. Coronary arteries arose as usual. Only two pulmonary veins	From a female child, which was small, but apparently healthy, when born. Soon after it had difficulty of breathing, and became livid on excitement or exertion. It died in a crying attack when ten and a half months old.
9 HOUSTON, 'Dublin Hosp. Reps.,' vol. v, 1830, p. 324, Case 2	Pulmonary small, but pervious down to its origin, where it was totally blocked up	Foramen ovale round and wide, and formed a direct communication between the auricles	Ductus arteriosus large and pervious	Heart larger than natural. Right auricle double its natural size. Aperture also large, and rt. vent. larger than the left. Left aur. small. Aorta much dilated at its origin, and arose from right ventricle	The infant son of a medical man, which was convulsed and livid at birth. The convulsions did not recur for six months, but the lividity continued. After that time the attacks again occurred at intervals, and he died in one when eighteen months old.

10 SPITAL, 'Edinb. Med. and Surg. Journ.,' vol. xliv, 1835, p. 109	Pulmonary artery arose naturally, but was a small vessel, only capable of admitting a very small probe, and was quite impervious at its origin; but the cavity gradually increased up to its union with ductus arteriosus	Foramen ovale sufficiently open to admit a large goose-quill	Ductus arteriosus open, and admitted a large probe freely, and divided into the usual branches to the lungs	Heart about the usual size. Sept. ventricul. slightly defective. Aorta arose immediately above, and was very large as far as the ductus arteriosus	In a female child, which lived twenty-three days, and was very cyanotic from birth, and afterwards had attacks of syncope.
11 FEARN, 'Lancet,' 1835, vol. i, p. 312	Pulmonary artery much smaller than usual, and orifice closed by a thin membrane, which had the appearance of the valves united at their margins	Foramen ovale as largely open as in the fœtal state	Ductus arteriosus closed. No source of pulmonary supply was detected, and it is supposed that the blood retrograded through the pulmonary veins and branches of pulmonary arteries into the trunk	Aorta nearly twice its natural size, and arose above a deficiency in the sept. of the ventricles. Fluid in the pericardium	In a child which lived seven weeks, and had always had difficulty of breathing, and especially when in the erect position. It was also very sleepy, and on crying became very livid. It became much emaciated.
12 LEDIBERDER, 'Bullet. de la Soc. Anat.,' 11me année, 1836, p. 68	Pulmonary artery half the size of the aorta, and terminating below in a cul de sac, which had no communication with the ventricle	Foramen ovale open, but easily covered by its valve	Ductus arteriosus replaced by a direct opening between the aorta and pulmonary artery, near the bifurcation of the latter vessel	A deficiency at the upper part of the sept. vent., above which the aorta arose. Aorta unusually large, and gave off its branches as usual	In a boy twelve days old, who had hardening of the cellular tissue, and who died of pneumonia in the Enfants Trouvés

Author and reference.	Seat and form of obliteration.	State of foramen ovale and auricular septum.	State of ductus arteriosus and source of pulmonary supply.	Condition of other parts of heart and extent of septal defect.	History of case.
13 LAURENCE, Ibid., 12me année, 1837, p. 216	Pulmonary artery formed a cul de sac from ductus arteriosus, and at ventricle was separated from the cavity by a diaphragm formed by the lining membrane of the artery and ventricle, and muscular tissue half a line thick	Foramen ovale not reported	Ductus arteriosus arose from the aorta as usual, and supplied the pulmonary artery and branches	Aorta arose above an aperture in the sept. vent., and communicated equally with the two ventricles	In a female child which lived fifteen days in the Enfants Trouvés, and during that time was deeply cyanosed, and had œdema of the integuments, with diarrhœa and vomiting. It became very pallid after having been bled by leeches. There was a bruit de souffle at the heart.
14 RAOUL-CHASSINAT 'Arch. Gén. de Méd.,' 2me série, t. xi, 1836, p. 80, accompanied by a good drawing	Trunk of pulmonary artery rudimentary, half an inch in length, and coats thin. The origin from the ventricle impervious	Foramen ovale admitting little finger	Ductus arteriosus would admit a crowquill, and opened into the pulmonary branches	Heart of small size consisted of three cavities, the right vent. being divided between the sinus and infundibular portion. Rt. aur. large and lined by fibrinous concretions. Septum of the vent. was deficient, and the aorta, which was unusally large, arose from both ventricles. Only one pulmonary vein entered the left aur., the other passed through the diaphragm and entered the vena cava asc.	From a child which had a hernia of the liver, and survived twelve days. It was not at any time cyanotic, and breathed freely. It died with diarrhœa and symptoms of enteritis.
15 J. G. SMITH, 'Lancet,' 1841-42, vol. i, p. 543	Pulmonary artery wanting, except a small rudiment of one passing from the ventricle in the direction of the ductus arteriosus	Foramen ovale sufficiently open to admit a goose-quill obliquely	A vessel (? the ductus arteriosus) which arose from the under surface of the arch, and divided into two branches distributed to the lungs	Heart of very large size, and right auricle and ventricle very large, and the septum incomplete. Aorta, which was very large, arose from the two ventricles. Left ventricle small	In a child which lived eight months, and was very livid soon after birth. It was subject to convulsive attacks, and had difficulty of breathing, and then became very dark.

16 Douglas, 'Med. Gaz.,' vol. xxxi, 1843, p. 16	Pulmonary artery less in size than a writing quill, pervious down to its origin, where it became quite obliterated; no trace of valves	Foramen ovale open to the extent of three eighths of an inch in diameter	Ductus arteriosus scarcely larger than a crow-quill, but pervious and connected with the two pulmonary branches	Deficiency in the sept. vent. which would admit the forefinger. Aorta arose equally from the two ventricles, and was a third larger than usual	In a boy, who lived fifteen months, and was livid at birth, and continued more or less so during his life, especially after he was seven or eight months old. He was subject to convulsive attacks and difficulty of breathing.
17 Friedberg, 'Die Angeb. Krankheit.des Herzens,' Leipzig, 1844, p. 109. A heart preserved in the Berlin Museum	Pulmonary artery closed	—	Ductus arteriosus conveyed the blood from the aorta	Septum of the ventricles imperfect	—
18 Shearman, 'Prov. Med. and Surg. Journ.,' 1845, p. 484	Pulmonary artery like a very small vein, and valves quite rudimentary. "The vessel had given passage to little (if any) blood"	Foramen ovale open	Ductus arteriosus not named in the report, and no explanation given of the source of pulmonary supply	The heart with attached pericardium weighed 10 oz. Aperture in base of sept. of vent. sufficiently large to admit the little finger. Aorta communicated with both ventricles. Right auricle large, and left small	In a girl upwards of nine years of age, subject to a slight cough and occasional hæmoptysis, and who, when that occurred, looked blue about the face. There was also jugular pulsation. The lungs were found full of grey tubercles.[1]

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[1] This case was probably one of very small pulmonary arteries, still, however, pervious. See Dr. Ramsbotham's case, reported as one in which there was no pulmonary artery, but which I found to be incorrectly described. 'Malformations,' 2nd vol., p. 60.

Author and reference.	Seat and form of obliteration.	State of foramen ovale and auricular septum.	State of ductus arteriosus and source of pulmonary supply.	Condition of other parts of heart and extent of septal defect.	History of case.
19 BABINGTON, 'Chevers' Collection of Facts,' &c., 'Med. Gaz.,' 1846, vol. 38 (N.S., vol. iii), p. 282. Reprinted, 1851, p. 14	No distinct pulmonary orifice, but in the place of the artery there was a cord impervious below, but open above though containing coagulum, which passed from ventricle to point of bifurcation of pulmonary artery. The branches were pervious, but the left also was filled with coagulum	Foramen ovale closed, but an aperture in sept. admitting the passage of a probe	The ductus arteriosus arose below the arch and was pervious. It gave off two branches to the right lung (and one of them, if not both, communicated with the branches of the pulm. art.), and a very small vessel to the left lung. About half an inch below the arch vessels, evidently enlarged bronchial arteries, arose and were distributed to the lungs on each side	Heart large; an oblique aperture in the sept. vent., capable of admitting the first joint of the forefinger. The aorta arose from the right ventricle. Both ventricles large and powerful	An old-fashioned looking boy, æt. 10, who was intensely cyanosed, and died of acute pulmonary inflammation.
20 CHAMBERS, Chevers, 'Med. Gaz.,' 1846, vol. 38 (N. S., vol. iii), p. 284. Collection reprinted, p. 15.	Small depression at upper part of right ventricle, which was evidently the rudiment of the pulmonary orifice completely occluded by dense fibrous membrane. The trunk of the pulmonary artery formed a narrow passage which joined the obliterated ductus arteriosus, and then divided into two branches	Foramen ovale closed	Ductus arteriosus attached to the aorta half an inch above its origin, but cavity perfectly closed. The source of pulm. supply could not be ascertained from the prep., but Dr. Chevers supposes a branch had united with pulm. arteries from left subclav. art.	Pericardium attached to heart by old adhesions. Right auricle and ventricle large and strong; aperture in sept. vent. admitting little finger. Aorta arose from right ventricle. Left auricle small, and received five pulmonary veins	In the case of a boy, nine or ten years of age, who had laboured from birth under usual symptoms of morbus cœruleus. He had several times had hæmoptysis, and died rather suddenly of pulmonary obstruction

21 CHEVERS, 'Pathol. Transact.,' vol. i, 1846-47, 1847-48, p. 204; Mr. Kellock's case	A small cul de sac leading to place of origin of pulmonary artery, and terminating there by an impervious partition, formed of endocardium and a thin layer of muscular fibres	Sufficiently open to admit a large goose-quill	Ductus arteriosus very small, but connected with pulmon. artery. The trunk of the pulm. art. contained adherent coagulum. Dr. Chevers supposes that there was, probably, some other source of pulmonary supply	Right auricle large. Right vent. remarkably strong and capacious, and aorta arose from it. Left auricle and ventricle relatively small	In a child apparently several weeks old, but without any history.
22 PEACOCK, 'Path. Transac.,' vol. i, 1846-47, 1847-48, p. 205; 'Malformations,' &c. 2nd edit., 1866. Case v. Dr. Bentley's patient, p. 68	Pulmonary artery, indicated by small but solid cord, which passed from the usual point of origin of the vessel to the bifurcation of the ductus arteriosus	Foramen ovale capable of being covered by its valve, which however was not adherent so as to admit flow of blood from right to left. Eustachian valve imperfectly developed	Ductus arteriosus as large as a goose quill, and furnished supply to the pulmonary branches	Heart large and much expanded transversely; weighed $3\frac{1}{2}$ oz. avoird. Right auricle extremely large, and walls thick; sinus of right ventricle also large and powerful. Infundibular portion a mere chink. Aorta arose chiefly from sinus of right ventricle, and was very large as far as duct. art. Cor. art. and other branches arose naturally. Left aur. and ventricle very small	In a male child cyanotic from birth, but face pale and puffy, subject to attacks of palpitation, difficulty of breathing, and convulsions, in which he became very dark. He died suddenly when eleven and half months old. Head very irregularly formed, narrow in front, and with anterior fontanelle projecting, long and broad behind. Loud systolic murmur heard over large portion of front of chest, and less distinctly to the left of the spine behind.
23 GRAILY HEWITT, 'Path. Trans.,' vol. viii, 1856-57, p. 107	Pulmonary artery very small, and obliterated at its origin from the ventricle. It bifurcated after a course of rather less than an inch	Foramen ovale open by an oblique passage	Small vessel, supposed to be the ductus arteriosus, proceeding from the aorta to the pulmon. arteries	Ventricular septum deficient to the extent of allowing of the passage of the little finger. Aorta arose above the aperture	A male child, apparently healthy when born, but which became jaundiced in four days, and died when fourteen weeks old. Towards the latter part of its life the infant was slightly cyanosed on crying, and had occasional convulsions and some œdema of the face. Loud systolic murmur heard over whole front of chest and also at the back.

Author and reference.	Seat and form of obliteration.	State of foramen ovale and auricular septum.	State of ductus arteriosus and source of pulmonary supply.	Condition of other parts of heart and extent of septal defect.	History of case.
24 QUAIN and SIBBALD, 'Path. Trans.,' vol. viii, 1856-57, p. 167	Pulmonary artery so much narrowed as to have become practically obliterated at the origin. The trunk of the vessel pervious	Foramen ovale not named, but auricle stated to be healthy	Ductus arteriosus not named. From the post. third of ascending aorta, and from about an inch of descend. aorta, there were three branches given off on each side, which passed to the lungs. The pulm. art. received blood, conveyed to it by the middle branch on the left side	Septum of ventricles deficient at upper part over space capable of admitting large goose-quill. Aorta arose from right ventricle; valves only two in number. Vessel very large from origin to arteria innominata. Ventricles of nearly equal thickness	In a child, which appeared healthy at birth, and died at the age of ten months, with symptoms of pneumonia, systolic bruit at base of heart, and a very distinct thrilling pulsation felt at the suprasternal notch.
25 BALY, 'Path. Tr.,' vol. x, 1858-59, p. 90	Pulmonary art. not larger than a crow-quill, and coats as thin as those of veins; impervious at its origin, and formed a cul de sac containing small discolorised coagulum attached to its rudimentary valves	Foramen ovale open	Ductus arteriosus fully open, and gave off the usual pulm. branches	Opening at top of sept.vent., which admitted tip of little finger. Aorta arose above aperture. Vessel very large. Right aur. and vent., unusually large, and walls thick	In a female infant, aged nine and half months, an out-patient at St. Bartholomew's. Not marked cyanosis, but colour ash-grey and hands and feet dusky, became very dark on coughing and crying. Loud bellows murmur attended the systole of the ventricles over the whole cardiac region.
26 CARL HEINE, 'Angeborne Atresie des Ostium Arteriosum dextrum,' Tubingen, 1861	Pulmonary artery very small, with distinct annular indentation at its commencement. Orifice entirely closed by transverse membranous partition, into which the muscular structure was directly inserted below, and which displayed no trace of valves	Foramen ovale freely open, but provided with the usual valve. Both thyroid and thymus large	Ductus arteriosus had the usual origin, but was longer than in general. It opened into the left pulmonary branch, & supplied blood to trunk and branches	Heart wider than natural. Wide opening in septum ventricularium in form of upright trapezium, with rounded angles. Aorta arose entirely from right ventricle, and was of large size. Right aur. and vent. large; left, relatively small	A female child, which was healthy when born, but which only survived two days, being during the last day and a half alternately livid and pale, but especially the former. It had difficulty of breathing and suffocative attacks. Another elder child lived only the same time, and also probably had some cardiac anomaly.

Malformation of the heart; contraction or stenosis of the pulmonary orifice; aorta arising from both ventricles.

This case of malformation occurred in the practice of Mr. Geo. Gaskoin, who furnished the following report of the patient during life:—

"He was a boy of 8½ years of age, and had presented the usual symptoms of morbus cœruleus in an aggravated degree from birth. He was very tall and straight-limbed, with small muscular development. His head was large, with a high forehead, and his fingers and toes were much clubbed. His respiration was so easily hurried that it was with difficulty he could mount one flight of stairs, and even riding in a perambulator made him ill for a few days. His temper was capricious. His appetite was uncertain; he took meat and bread and yelk of egg, but no vegetables. He would live on a single article of pastry for a fortnight at a time, refusing all other food. He seemed to have a peculiar bodily tenderness or hyperæsthesia, so that he was usually in dread of any one touching him or pressing upon his limbs. He loved the sun, but seemed to have got his death by the hot weather in June and July last, during which time he had several alarming fits of dyspnœa, in one of which he died—the effect being probably increased by a rather large dinner which he had eaten. He had had severe attacks of measles and smallpox, and recovered favorably from them."

The heart weighed 5¼ oz. avoir. It was of an unusual form, being very broad. The right ventricle constituted the largest portion of the front of the organ, and the aorta was of large size and the pulmonary artery very small. On opening the heart the cavity of the right ventricle was found very large, and its walls thick and firm. It consisted almost wholly of the sinus, the infundibular portion being very small. The orifice of the pulmonary artery was so constricted as only to admit the passage of a crow-quill. There were no pulmonary valves, but in their place there was an annular constriction found by a thick membrane, apparently composed of endocardium and muscular structure. On one side of this there was an opening which passed down from the artery towards the ventricle, and was there closed, which may have been the remains of one of the sinuses. The septum of the ventricles was incomplete over a large space, so that the aorta communicated with both ventricles. The left ventricle was relatively to the right small and its walls flaccid. The aortic valves were much diseased, being thickened and opaque and especially at their free edges. The ascending portion of the aorta was unusually wide. The pulmonary artery was very much smaller than the aorta, and its coats were thin. It was very short, and divided into the usual branches almost immediately after its origin. There was no appearance of the ductus arteriosus in connection with the pulmonary artery, and the aorta was cut off too short for the opposite end of the vessel, or the ligament, if present to be seen. The right auricle was large, the foramen ovale closed, and the left auricle natural.

The dimensions of the heart were as follows:—

Girth of the right ventricle externally, 49 French lines=110·25 mm. =4·34 English inches; of the left, 31 French lines=69·75 mm.= 2·74 English inches.

The walls of the right ventricle averaged 4 French lines in width =9 mm.=·35 English inches; of the left, 5 French lines=11·25 mm. =·44 English inches.

The right auriculo-ventricular aperture had a circumference of 42 French lines =94·5 mm.=3·72 English inches; of the left, 30 French lines=67·5 mm.=2·66 English inches.

The pulmonic, 5 or 6 French lines=11·25 to 13·5 mm., and ·444 to ·53 English inches.

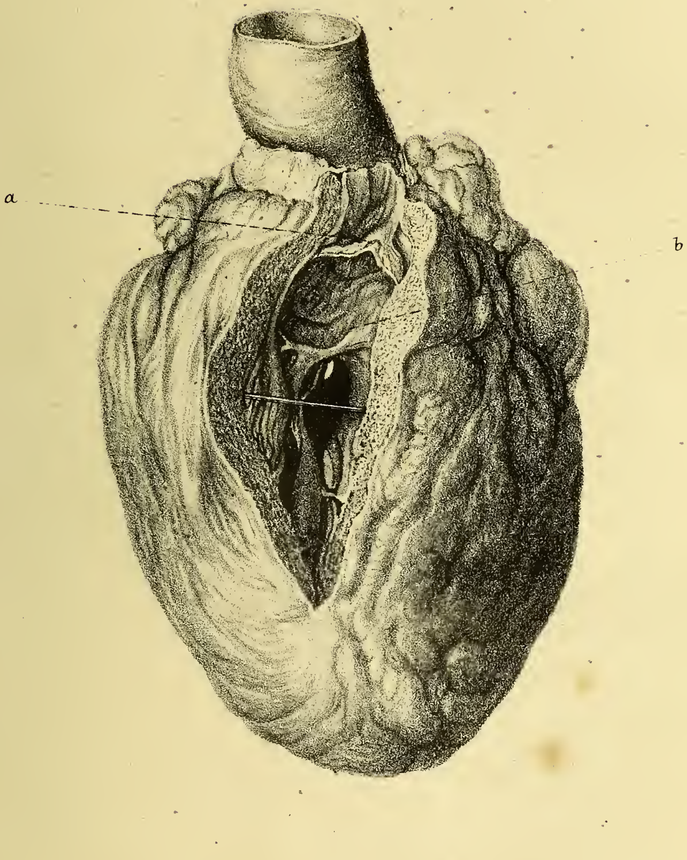
The communication between the sinus of the right ventricle and the aorta admitted a ball measuring 33 French lines in circumference, = 74·25 mm., and 2·93 English inches. That between the left ventricle and the aorta 30 French lines=67·5 mm., and 2·68 English inches.

DESCRIPTION OF PLATE

Illustrating Dr. Peacock's case of Malformation of the Heart, consisting in atresia of the orifice of the pulmonary artery, and origin of the aorta from both ventricles.

a. Septum formed by fusion of the valves, by which the infundibular portion of the right ventricle is separated from the pervious canal of the pulmonary artery. The chink or depression, probably indicating the site of a former opening, is shown in the plate.

b. Muscular fibres marking the point of separation of the infundibular portion of the right ventricle from the sinus.



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